

## TRANSMITTAL LETTER TO THE UNITED STATES

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DESIGNATED/ELECTED OFFICE (DO/EO/US)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

CONCERNING A FILING UNDER 35 U.S.C. 371

09/869056

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/JP00/07422

October 24, 2000

October 27, 1999

TITLE OF INVENTION

MOBILE COMMUNICATION TERMINAL APPARATUS AND HAND-OVER METHOD

APPLICANT(S) FOR DO/EO/US

Hideki KANEMOTO

Osamu KATO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

## Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Claim for Priority with PCT/IB/304

PCT/IB/308

PCT/RO/101

ATTORNEY'S DOCKET NUMBER

U97009526

**PCT.JP00/07422**

**L9289.01155**

24. The following fees are submitted:.

**CALCULATIONS** PTO USE ONLY

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5) ) :**

- |  |                  |
|--|------------------|
| <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO . . . . . | <b>\$1000.00</b> |
| <input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO . . . . .  | <b>\$860.00</b>  |
| <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO . . . . .  | <b>\$710.00</b>  |
| <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) . . . . .   | <b>\$690.00</b>  |
| <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) . . . . .   | <b>\$100.00</b>  |

**ENTER APPROPRIATE BASIC FEE AMOUNT =**

**\$860.00**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

**\$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	6 - 20 =	0	x \$18.00
Independent claims	2 - 3 =	0	x \$80.00

**\$0.00**

**\$0.00**

Multiple Dependent Claims (check if applicable).

**\$0.00**

TOTAL OF ABOVE CALCULATIONS =

**\$860.00**

- Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.

**\$0.00**

**SUBTOTAL =**

**\$860.00**

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

**\$0.00**

TOTAL NATIONAL FEE =

**\$860.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable)**. ☐

**\$40.00**

TOTAL FEES ENCLOSED =

**\$900.00**

Amount to be: refunded
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\$	\$
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- a. ☒ A check in the amount of \$900.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-4375. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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NAME \_\_\_\_\_

**28,732**

REGISTRATION NUMBER

**June 25, 2001**

DATE \_\_\_\_\_

## DESCRIPTION

MOBILE COMMUNICATION TERMINAL APPARATUS AND HAND-OVER  
CONTROL METHOD

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## Technical Field

The present invention relates to a mobile communication terminal apparatus and a hand-over control method.

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## Background Art

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Hand-over, by which a mobile station observes control channel signals such as a perch channel signals at waiting time for anytime selection of a cell or a sector to which the above station is belonging, is called as idle hand-over. After the above idle hand-over, the above mobile station is put into a waiting state to accept outgoing calls of the own station and to receive paging channel signals for detection of incoming-calls to the own station. As described above, the above mobile station efficiently selects the cell or the sector, using the above waiting time, by performing the above idle hand-over.

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In a conventional idle hand-over method, the above mobile station compares the received quality between a control channel signal transmitted from a base station in a cell to which the above mobile station is belonging, and a control channel signal transmitted from a base

station in an adjacent cell and other cells, and performs hand-over so as to select a base station with better received quality. Moreover, the above mobile station performs in a similar manner hand-over between sectors  
5 by comparison of the received quality among control channel signals assigned to each sector.

However, the above conventional idle hand-over method has the following problems. Hereinafter, the problems of the conventional idle hand-over method will  
10 be described, referring to FIG. 1 and FIG. 2. FIG. 1 is a conceptual diagram of cells in a radio communication system, and FIG. 2 is a diagram showing relations between fluctuation states of the received levels of control channel signals and selection states of cells in the  
15 conventional idle hand-over operation method.

In FIG. 1, a mobile station 30 is now located in the vicinity of the boundary between a cell 1 in which a base station 10 exists and a cell 2 in which a base station 20 exists. In such a case, the mobile station 30 may  
20 receive both of a control channel signal assigned to the cell 1 (hereinafter, called as "cell 1 signal") and that assigned to the cell 2 (hereinafter, called as "cell 2 signal").

In such a state, as the received levels of the both  
25 are comparable each other, there is small difference in the received quality at the mobile station 30 between communicating with the base station 10 and communicating

with the base station 20. That is, the mobile station 30 has no special need for hand-over.

However, in such a state, which signal of the cell 1 signal and the cell 2 signal is received by the mobile station 30 at higher level is changed every moment due to fluctuated propagation environment and so on. Therefore, which cell of the cell 1 and the cell 2 is selected for the mobile station 30 is changed every moment.

Specifically, as the received level of the cell 1 signal and that of the cell 2 signal is comparable each other and there is small difference between them as shown in FIG. 2, a control channel signal with a higher received level is changed every moment at timing of  $t_1$  through  $t_4$  for reception and selection of control channel signals. Accordingly, a control channel signal and a cell to be selected for the mobile station 30 are also changed every moment at timing of  $t_1$  through  $t_4$ . Thereby, there have occurred a problem that unnecessary hand-over operations are frequently performed to cause increased battery consumption at the mobile station 30.

Moreover, there has been another problem that the mobile station 30 performs useless operations, that is, receives a plurality of control channel signals, compares the received levels among them, and selects one cell at every timing of  $t_1$  through  $t_4$ , though there is no special need for the hand-over.

Furthermore, there has been further another problem

that there is an increased possibility of failed incoming-calls to cause reduction in an incoming-call success rate when hand-over is frequently generated, as the mobile station 30 has a need for switching of received  
5 paging channel signals for detection of incoming-calls from base stations at each selection of one cell.

#### Disclosure of Invention

The object of the present invention is to provide  
10 a mobile communication terminal apparatus and a hand-over control method by which battery saving may be achieved by reduction in useless processing for hand-over control, and the frequency of unnecessary hand-over, and, at the same time, reduced incoming-call success rate may be  
15 prevented.

In order to achieve the above object, the present invention has a configuration that the frequency of selection operation of a cell or a sector by comparison of the received quality among a plurality of control  
20 signals such as perch channel signals (hereinafter, called as "comparison selection operation") is reduced, and, at the same time, a plurality of paging channel signals are received, when hand-over is generated at a frequency equal to or higher than a predetermined frequency.

#### Brief Description of Drawings

FIG. 1 is a conceptual diagram of cells in a radio

communication system.

FIG. 2 is a diagram showing relations between fluctuation states of the received levels of control channel signals and selection states of cells in a conventional idle hand-over method.

FIG. 3 is a principal block diagram showing a schematic configuration of a radio reception apparatus installed in a mobile communication terminal apparatus according to one embodiment of the present invention.

FIG. 4 is a flowchart for description of operations of the mobile communication terminal apparatus according to the above embodiment of the present invention.

FIG. 5 is a diagram showing relations between fluctuation states of the received SIRs of control channel signals and selection states of cells in a hand-over control method according to the above embodiment of the present invention.

#### Best Mode for Carrying Out the invention

Hereinafter, one embodiment according to the present invention will be described in detail, referring to drawings.

#### (Embodiment)

FIG. 3 is a principal block diagram showing a schematic configuration of a radio reception apparatus installed in a mobile communication terminal apparatus according

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times of measurement timing during which measurement of the received SIRs of control channel signals is not performed, when the measurement section 105 does not measure the received SIRs of control channel signals for the measurement timing subsequent to the measurement timing at which hand-over is generated at a frequency equal to or higher than the predetermined frequency.

A selected cell storing section 107 stores information denoting the currently selected cell.

Information denoting a cell is, for example, a unique number assigned to each cell, and so on. A selection section 108 selects a control channel signal with the maximum received SIR among measured received SIRs for selection of a cell, only when the received SIRs of control channel signals are measured in the measurement section 105.

A recording section 109 accumulates and records a number of changing times of cells to be selected, that is, a number of times for hand-over. And, the recording section 109 accumulates and records the number of selected times till the present time for each cell.

A judgement section 110 controls to reduce the frequency of comparison selection operations when the frequency of changing cells to be selected becomes equal to or higher than the predetermined frequency. Moreover, the judgement section 110 controls the despreading section 103 for reception of paging channel signals

transmitted from a plurality of base stations in high order with regard to the number of selected times, when the frequency of changing cells to be selected becomes equal to or higher than the predetermined frequency. Here, the above paging channel signal is a control channel signal for a mobile station to detect incoming-calls to the own station.

Now, operations for a mobile communication terminal apparatus with the above configuration will be described. FIG. 4 is a flowchart for description of operations of the mobile communication terminal apparatus according to the above embodiment of the present invention, and FIG. 5 a diagram showing relations between fluctuation states of the received SIRs of control channel signals and selection states of cells in a hand-over control method according to the above embodiment of the present invention.

A series of operations shown in the flow chart of FIG. 4 are performed respectively at predetermined timing of  $t_1$  through  $t_9$  as shown in FIG. 5. Hereinafter, it is assumed that a control channel signal assigned to the cell 1 is called as "cell 1 signal", and an assigned one to the cell 2 as "cell 2 signal".

In the first place, the measurement section 105 refers to a count value of the counter 106 at a step (hereinafter, shortened as "ST") 201. And, when the count value is "0", the measurement section 105 measures the received SIRs

of a plurality of control channel signals for feeding of the measurement result to the selection section 108 at ST 202.

Subsequently, the selection section 108 selects at  
5 ST 203 a control channel signal with the maximum received SIR according to the measurement result at ST 202. That is, a cell as a hand-over end is selected. Then, the selection section 108 feeds information denoting the selected cell to the judgement section 110.

10 Thereafter, the selection section 108 increases by one the number of selected times for the selected-this-time cell among numbers of selected times recorded in the recording section 109 at ST 204. Moreover, the selection section 108 increases by one the number  
15 of changing times for the selected cell recorded in the recording section 109, when there is a difference in the case of comparison between the currently selected cell and the selected-this-time cell, referring to the selected cell storing section 107. And, at the same time,  
20 the information stored in the selected cell storing section 107 is updated according to the selection result by the selection section 108.

Subsequently, the judgement section 110 refers to the recording section 109, and calculates the changing  
25 frequency of the selected cell for comparison with the predetermined threshold at ST 205. Here, the changing frequency of the selected cell means how many times the

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selected cell has been changed during predetermined times of measuring timing till the present time, that is, a value denoting a ratio of the changed times to the above predetermined times. That is, the changing frequency of the selected cell is a value denoting a hand-over execution frequency during a predetermined interval. Now, the changing frequency of the selected cell is calculated as "0.5 (50%)", when hand-over is assumed to be executed, for example, two times among four times of measurement timing till the present time.

When the above changing frequency is equal to or higher than the predetermined threshold, the judgement section 110 sets a predetermined number of times in the counter 106 at ST 206. Here, the above predetermined number of times means a number of times of measuring timing during which the measurement section 105 does not measure the received SIRs of control channel signals, and a number of times of measuring timing during without measurement of the received SIRs of control channel signals may be adjusted in an arbitrary manner by properly changing the above predetermined number of times. Specifically, when the predetermined number of times is set as "1", the measurement of the received SIRs is performed at every other measurement timing after the timing at which the changing frequency is equal to or higher than the predetermined threshold. Accordingly, when the predetermined number of times is set as "1", the

measurement frequency of the received SIRs may be reduced by half after the timing at which the changing frequency is equal to or higher than the predetermined threshold.

Then, the judgement 110 controls at ST 207 the  
5 despreding section 103 for reception of paging channel signals assigned to the selected cell according to information denoting the selected cell fed from the selection section 108. According to the above control, the despreding section 103 despreads the paging channel  
10 signals assigned to the selected cell for reception processing.

On the other hand, the measurement section 105 decreases a counter value of the counter 106 by one at ST 208, when the above counter value is not "0" at ST  
15 201. Moreover, in such a case, the measurement section 105 does not measure the received SIRs of the control channel signals. Then, the measurement section 105 feeds to the judgement section 110 a signal for notification that the received SIRs are not measured.

20 The judgement section 110 refers to the recording section 109 at ST 209, when the judgement section 110 accepts the above notification that the received SIRs are not measured. Then, the judgement 110 controls the despreding section 103 for reception of paging channel  
25 signals assigned to a plurality of cells in high order with regard to the number of selected times. Accordingly, by the above control, the despreding section 103

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despreads in parallel a plurality of paging channel signals transmitted from base stations with higher selection frequency, that is, base station reasonable as a selection candidate during timing at which the  
 5 received SIRs are not measured, and performs reception processing. Here, a plurality of the paging channel signals may be received, and there is no special limit on the number if the number is not a single. The range in high order may be properly set.

10 Timing for comparison selection operation and selected cells after the above operations are shown in FIG. 5. Black spots show points of timing for measurement of the received SIR of the cell 1 signal, and white spots points of timing for measurement of the received SIR of  
 15 the cell 2 signal in FIG. 5. Here, the mobile communication terminal apparatus is assumed to receive two control channel signals of the cell 1 signal and the cell 2 signal for convenient description.

Now, the counter value of the counter 106 is assumed  
 20 to be "0" as an initial state. The cell 1 is selected at measurement timing  $t_1$ , as the received SIR of the cell 1 signal is higher than that of the cell 2 signal. Similarly, the selected cells are changed at every measurement timing in the following way: the cell 2 is  
 25 selected at measurement timing  $t_2$ ; the cell 1 at  $t_3$ ; the cell 2 at  $t_4$ ; and the cell 1 at  $t_5$ .

Now, it is assumed, for example, that a predetermined

threshold of the changing frequency is a threshold showing a changing frequency during four times of measurement timing till the present time, and is set as "1 (100%)". Here, the changing frequency becomes "1 (100%)", and becomes equal to or higher than the predetermined threshold at t5, as the selected cell is changed every time at four times of measurement timing of t2 through t5. Then, the predetermined number of times (now, set as "1" here), is set in the counter 106. Accordingly, measurement of received SIRs is performed at every other timing after the timing t5 at which the changing frequency is equal to or higher than the predetermined threshold. That is, the next measurement of the received SIR of the control channel signal is performed at timing t7. As described above, the frequency of comparison selection operations may be reduced by half after the timing t5 at which the changing frequency is equal to or higher than the predetermined threshold.

Subsequently, the mobile communication terminal apparatus receives in parallel two paging channel signals transmitted from two base stations existing in the cell 1 and in the cell 2 respectively, both of which have a high selection frequency, at timing t6 and t8 during which the measurement of the received SIR is not performed.

Thus, according to the mobile communication terminal apparatus and the hand-over control method of the present embodiment, the frequency of comparison selection

operations may be decreased when the hand-over is generated at a frequency equal to or higher than the predetermined frequency. Thereby, the frequency of useless comparison selection operations and that of unnecessary hand-over operations may be reduced. Accordingly, battery saving may be achieved and, at the same time, the reduced incoming-call success rate due to frequent hand-over may be prevented.

Moreover, in the case of no comparison selection operations, the mobile communication terminal apparatus receives a plurality of paging channel signals. Therefore, the mobile communication terminal apparatus may surely perform incoming-calls even in the case of no comparison selection operations.

Furthermore, as control channel signals are individually assigned even to each sector, the mobile communication terminal apparatus according to the above embodiment may perform the hand-over control in a similar manner to the above one when the mobile communication terminal apparatus is located in the vicinity of the boundary between sectors.

Moreover, a plurality of despreading sections and demodulation sections have been provided for reception of a plurality of control channel signals and a plurality of paging channel signals in the mobile communication terminal apparatus according to the above embodiment. However, a plurality of control channel signals and a



plurality of paging channel signals may be received by time sharing activation of one desreading section and one demodulation section.

Moreover, the mobile communication terminal apparatus and the hand-over control method according to the above embodiment may be also applied to idle hand-over operations. When applied, reduction in the frequency of useless comparison selection operations and for unnecessary hand-over may be realized at idle hand-over.

And, a radio reception apparatus may be made inactive to a sleeping state during no measurement of a received SIR of a control channel signal in the mobile communication terminal apparatus according to the above embodiment.

As described above, battery saving may be achieved by reduction in the frequency of useless processing at hand-over control and for unnecessary hand-over, and, at the same time, the reduced incoming-call success rate may be prevented, according to the present invention.

This application is based on the Japanese Patent Application No. HEI 11-305419, filed on Oct. 27, 1999, the entire contents of which are expressly incorporated herein by reference.

#### Industrial Applicability

The present invention may be applicable to a mobile communication terminal apparatus used in a mobile communication system.

## CLAIMS

1. A mobile communication terminal apparatus comprising:

a comparison selector for performing a comparison  
5 selection operation by which a control channel signal  
with the best received quality is selected after  
comparison of the received quality of a plurality of  
control channel signals; and

a measurer for measuring of a switching frequency  
10 of control channel signals at a predetermined interval,  
wherein

said comparison selector reduces the frequency of  
the comparison selection operations when the switching  
frequency is equal to or heigher than a predetermined  
15 threshold.

2. The mobile communication terminal apparatus  
according to claim 1, further comprising:

a receiver for receiving a plurality of control  
channel signals for detection of incoming-calls, when  
20 the frequency of the comparison selection operations is  
reduced.

3. The mobile communication terminal apparatus  
according to claim 2, further comprising:

a recorder for recording of selection times for each  
25 hand-over end according to a selection result, wherein  
said receiver receives a plurality of control channel  
signals, which are assigned hand-over ends with higher

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selection frequency, for detection of incoming-calls.

4. The mobile communication terminal apparatus according to claim 1, wherein said mobile communication terminal apparatus is activated at waiting time.

5 5. A hand-over control method, wherein

a frequency of comparison selection operations for selection of a control channel signal with the best received quality among a plurality of control channel signals is reduced, when a frequency of hand-over operations which is generated during a predetermined interval is equal to or higher than a predetermined threshold.

6. The hand-over control method according to claim 5, wherein

15 a plurality of control channel signals for detection of incoming-calls are received in the case of reduction in the frequency of the comparison selection operations.

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## ABSTRACT

A recording section 109 records a hand-over generation frequency at a predetermined interval according to the result of comparison selection operations in a selection section 108, a judgement section 110 compares the hand-over generation frequency and a predetermined threshold, and a measurement section 105 decreases a measurement frequency of the received quality of a control channel signal after the hand-over generation frequency is equal to or higher than the predetermined threshold. Moreover, the judgment section 110 controls a despreading section 103 for reception of a plurality of paging channel signals in the case of reduction in the measurement frequency.

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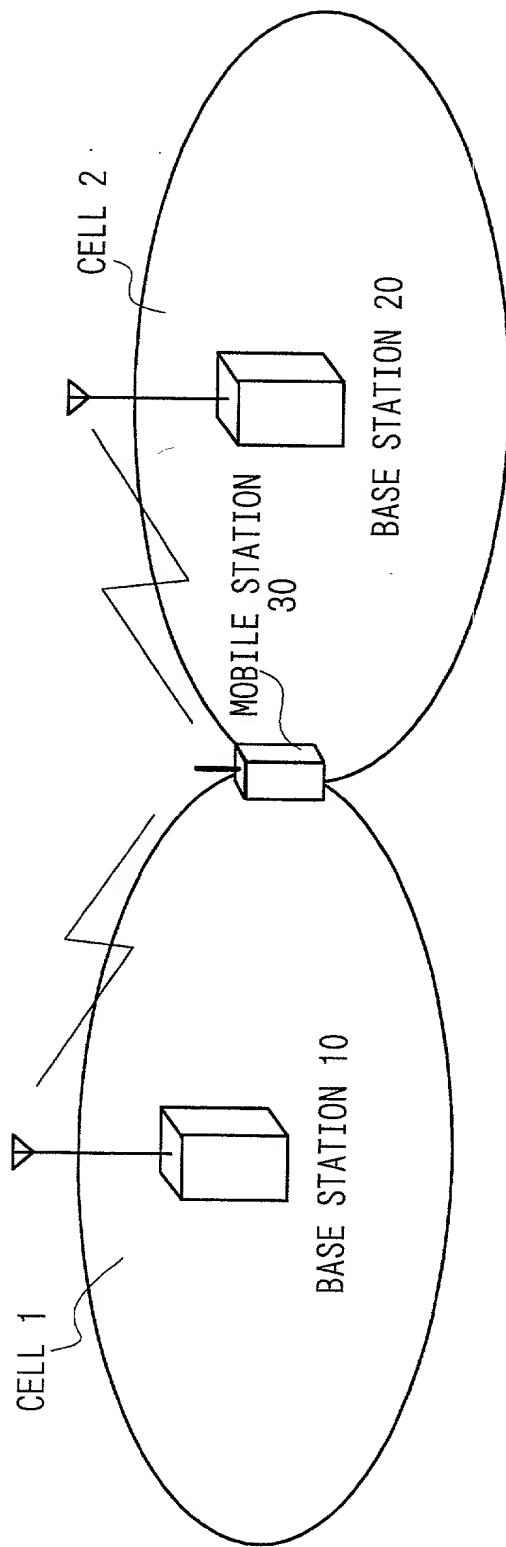


FIG. 1

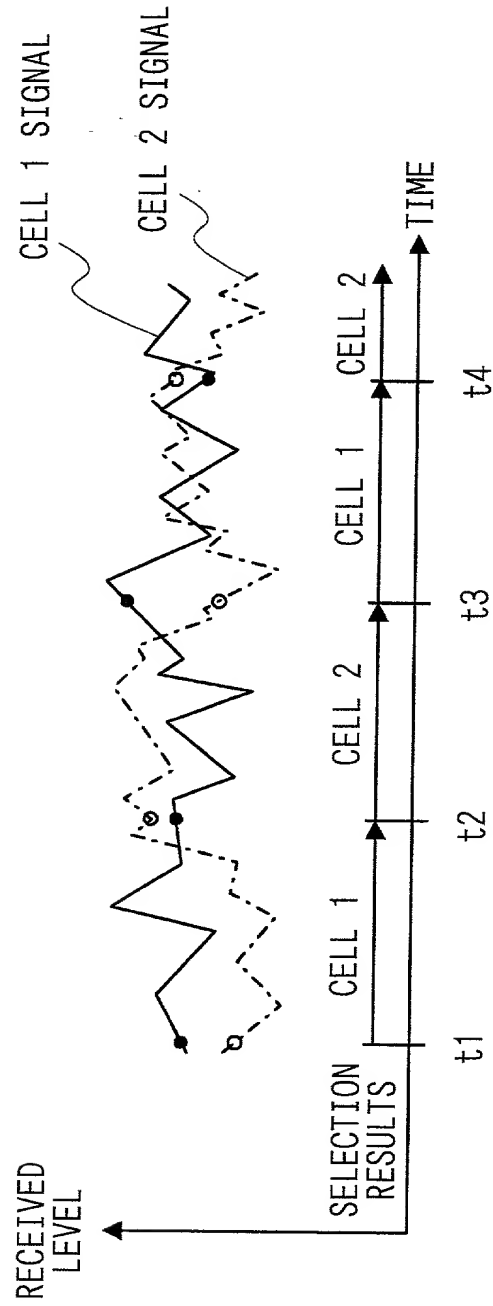


FIG. 2

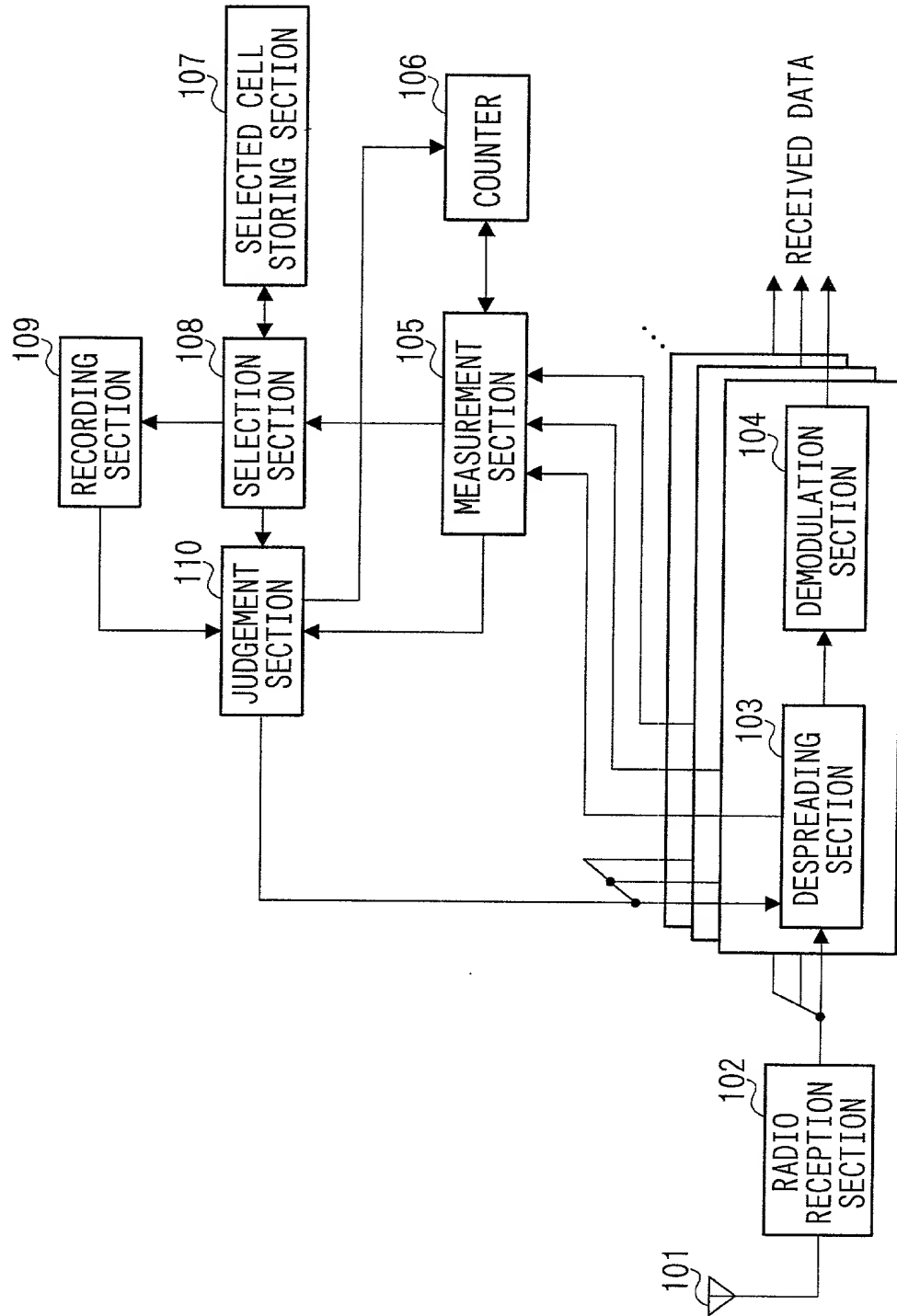


FIG. 3

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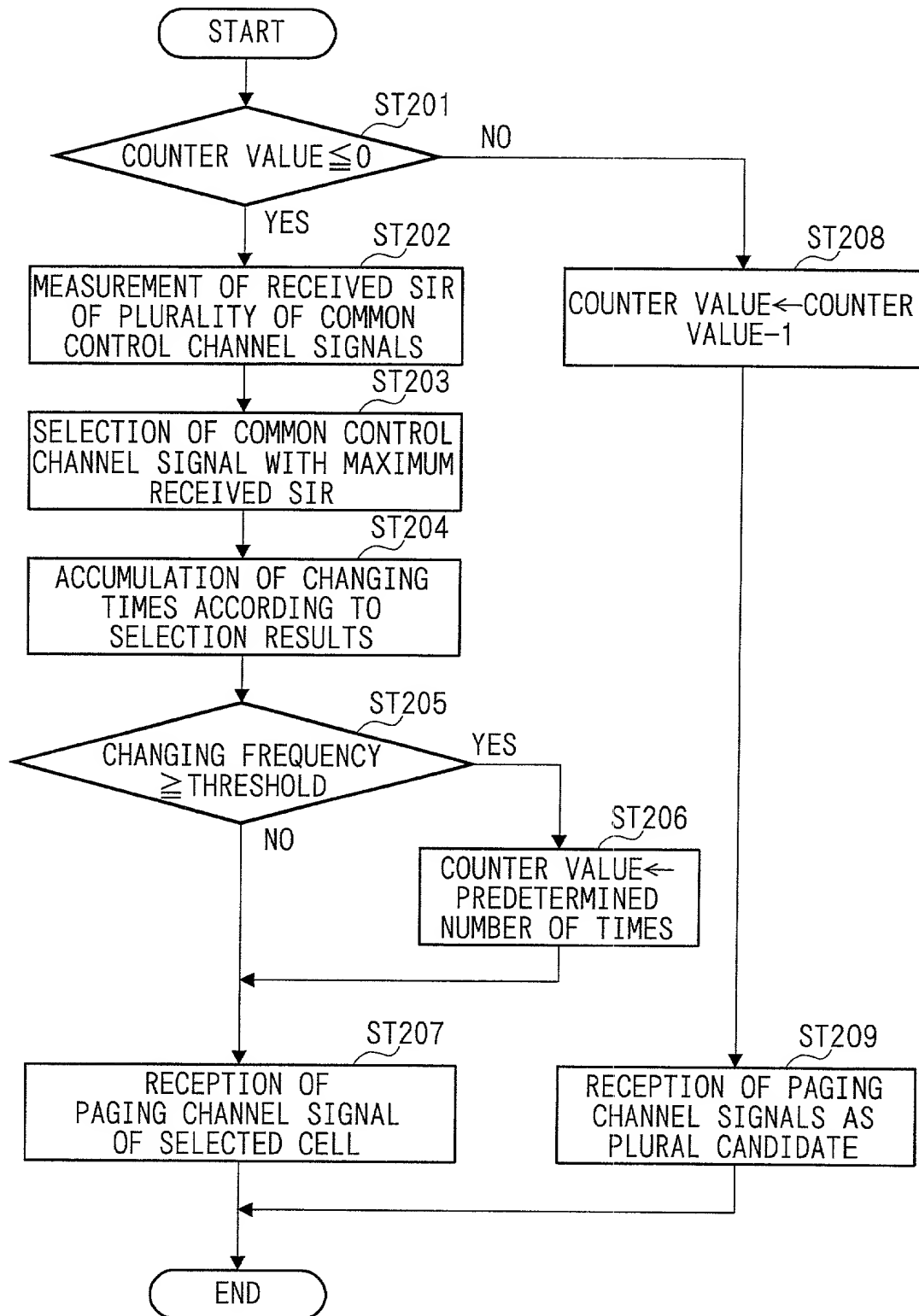


FIG. 4



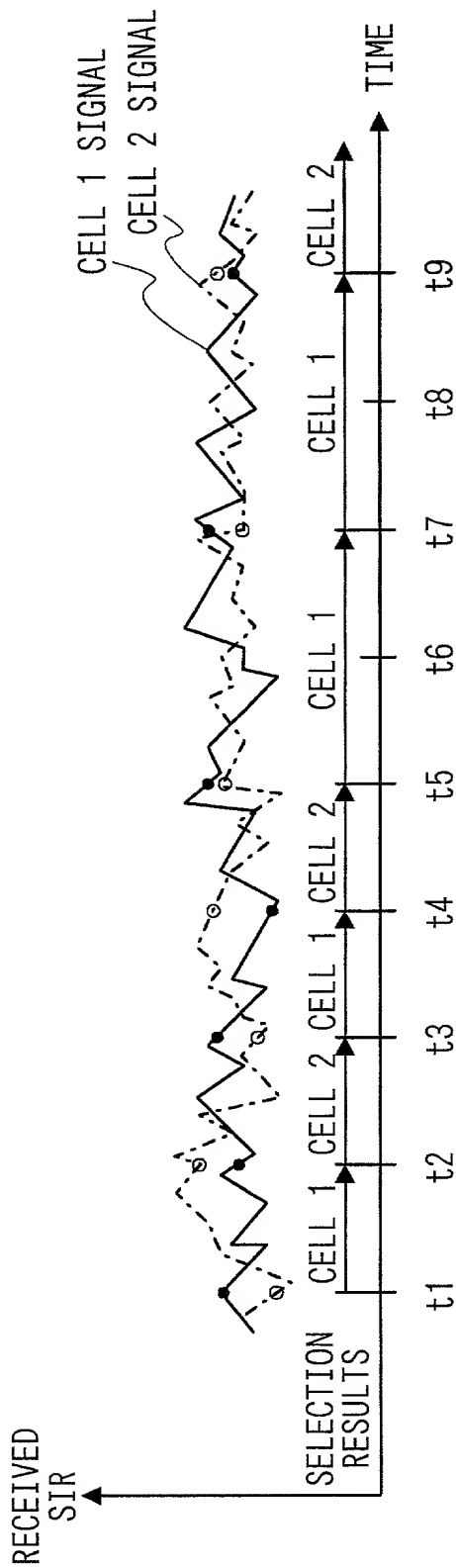


FIG. 5

APPLICATION FOR UNITED STATES PATENT  
Declaration for Patent Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on

the invention entitled: MOBILE COMMUNICATION TERMINAL APPARATUS AND HAND-OVER CONTROL METHOD

the specification of which 2 (file no \_\_\_\_\_ )

(check at least one) 3 ☒ is attached hereto  
4 ☐ was filed on \_\_\_\_\_ as (5) U.S. Application Serial No. \_\_\_\_\_  
6 ☐ and was amended \_\_\_\_\_  
(if applicable)

Use this portion only if you are entering the U.S. National phase based on a PCT International Application designating the U.S.  
7 ☒ was filed as PCT international application  
8 Number PCT/JP00/07422  
9 on October 24, 2000  
and was amended under PCT Article(s) 19 and/or 34  
10 on \_\_\_\_\_ (if applicable).

I hereby declare that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended, by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me which is material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application (s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date earlier than that of the application(s) on which priority is claimed.

Prior (Foreign) Application(s) any Priority Claims Under 35 U.S.C. 119 Priority Claimed

<u>JAPAN</u> (Country)	<u>JP11-305419</u> (Number)	<u>27/10/1999</u> (Day/Month/Year Filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Country)	_____ (Number)	_____ (Day/Month/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No

☐ Additional foreign application numbers are listed on a supplemental priority data sheet attached hereto.

Priority Claim(s) from U.S. Provisional Application(s) – I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

11b

Application No. _____	Day/Month/Year Filed _____	Application No. _____	Day/Month/Year Filed _____
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Do not use this portion to identify a PCT application if the parent application is the U.S. National phase of the PCT application	I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between filing date of the prior application and the national or PCT international filing date of this application.		
	13 _____ (U.S. Application Number)	_____ (U.S. Filing Date)	_____ Status (patented, pending, abandoned)

I hereby appoint the following attorneys of the firm of Stevens, Davis, Miller & Mosher, L.L.P. as my attorneys of record with full power of substitution and revocation to prosecute this application and to transact all business in the Patent and Trademark Office:

(3) James E. Ledbetter, Reg. No. 28732; Thomas P. Pavelko, Reg. No. 31689; and Anthony P. Venturino, Reg. No. 31674.

ALL CORRESPONDENCE IN CONNECTION WITH THIS APPLICATION SHOULD BE SENT TO  
STEVENS, DAVIS, MILLER & MOSHER, L.L.P., 1615 L Street, N.W., Suite 850, Washington, D.C. 20036,  
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See page 2 for signature lines

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

PAGE 2 OF U.S.A. DECLARATION FORM

13a	Typewritten Full Name of Sole or First Inventor	1-00		
		<u>Hideki</u>		<u>KANEMOTO</u>
		Given Name	Middle Name	Family Name
14a	Inventor's Signature	<u>Hideki Kanemoto</u>		
15a	Date of Signature	<u>May</u>	<u>25</u>	<u>2001</u>
		Month	Day	Year
16a	Residence	<u>Yokosuka-shi</u>	<u>Kanagawa</u>	<u>JAPAN</u> JPX
		City	State or Province	Country
17a	Citizenship	<u>JAPAN</u>		
18a	Post Office Address (Insert complete mailing address, including country)	<u>6-2-801, Hikari no Oka,</u> <u>Yokosuka-shi, Kanagawa 239-0847 JAPAN</u>		
13b	Typewritten Full Name of Sole or Second Inventor	2-00		
		<u>Osamu</u>		<u>KATO</u>
		Given Name	Middle Name	Family Name
14b	Inventor's Signature	<u>Osamu Kato</u>		
15b	Date of Signature	<u>May</u>	<u>25</u>	<u>2001</u>
		Month	Day	Year
16b	Residence	<u>Yokosuka-shi</u>	<u>Kanagawa</u>	<u>JAPAN</u> JPX
		City	State or Province	Country
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18b	Post Office Address (Insert complete mailing address, including country)	<u>5-45-G302, Shonantakatori,</u> <u>Yokosuka-shi, Kanagawa 237-0066 JAPAN</u>		
13c	Typewritten Full Name of Sole or Third Inventor			
		Given Name	Middle Name	Family Name
14c	Inventor's Signature			
15c	Date of Signature	Month	Day	Year
16c	Residence	City	State or Province	Country
17c	Citizenship			
18c	Post Office Address (Insert complete mailing address, including country)			
13d	Typewritten Full Name of Sole or Fourth Inventor			
		Given Name	Middle Name	Family Name
14d	Inventor's Signature			
15d	Date of Signature	Month	Day	Year
16d	Residence	City	State or Province	Country
17d	Citizenship			
18d	Post Office Address (Insert complete mailing address, including country)			

\*Note to Inventor: Please sign name on line 15 exactly as it appears in line 14 and insert the actual date of signing on line 16. If there are more than four inventors, please add a copy of this page for identification and signatures for the additional inventors.